

# NASA News

National Aeronautics and  
Space Administration

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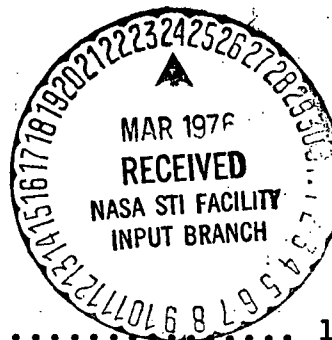
For Release IMMEDIATE

## Press Kit

Project NATO 3-A

RELEASE NO: 76-46

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For Release:

Bill O'Donnell  
Headquarters, Washington, D.C.  
(Phone: 202/755-2354)

IMMEDIATE

RELEASE NO: 76-46

## NASA TO LAUNCH THIRD NATO COMMUNICATIONS SATELLITE

The third in a series of military communications satellites to serve the North Atlantic Treaty Organization (NATO) is scheduled for launch by NASA's Kennedy Space Center from Cape Canaveral, Fla., April 22.

Launch window is 3:45 to 4:45 p.m. EST.

The spacecraft, NATO 3-A will be placed in synchronous orbit 36,000 kilometers (22,300 miles) altitude over the equator at 15.5 degrees W. Longitude due south of the westernmost coast of Africa by a NASA Delta launch vehicle.

The U.S. Air Force Space and Missile Systems Organization (SAMSO) will reimburse NASA for all costs associated with the launch, on behalf of NATO.

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The drum-shaped spacecraft is about 2.2 meters (86 inches) in diameter, 2.23 m (88 in.) long, with an overall length of about 3.1 m (122 in.) counting the antennas. It weighs 720 kilograms (1,540 pounds) at launch and after firing of its onboard apogee kick motor to place it in stationary orbit it will weigh 310 kg (677 lb.). Its design lifetime is seven years.

NATO 3-A will be placed in synchronous orbit some 48 hours after launch on the fifth apogee of the spacecraft when the apogee kick motor is fired. It will then drift eastward at the rate of four degrees a day to its final station at 15.5 degrees W. Longitude.

NASA's Goddard Space Flight Center, Greenbelt, Md., provides the Delta rocket to launch NATO 3-A. Aeronutronic-Ford Corp., Palo Alto, Calif., built the spacecraft and McDonnell Douglas Astronautics Co., Huntington Beach, Calif., manufactured Delta.

Two previous NATO spacecraft have been launched by NASA by the Delta -- in March, 1970, and in February, 1971.

A second identical satellite (NATO 3-B) is planned for launch by a Delta rocket in September of this year.

(END OF GENERAL RELEASE. BACKGROUND INFORMATION FOLLOWS.)

## DELTA 2914 LAUNCH VEHICLE

The spacecraft will be launched by a 2914 three-stage Delta launch vehicle, which has an overall length of approximately 35 m (116 ft.), and a body diameter of 2.4 m (8 ft.). The Delta launch vehicle has been successful in 93 per cent of its 120 launches during the past 15 years.

### First Stage

The first stage is a McDonnell Douglas extended-long-tank Thor booster with nine strap-on Thiokol Castor II solid-fuel rocket motors. The booster is powered by a Rocketdyne RS-27 engine using liquid oxygen (LOX) and liquid hydrocarbon propellants. The main engine is gimballed-mounted to provide pitch and yaw control from liftoff to main engine cutoff (MECO). Two liquid propellant vernier engines provide roll control throughout first stage operation and pitch and yaw control from MECO to separation of the first and second stages.

### Second Stage

The second stage is powered by a TRW TR-201 liquid-fuel pressure-fed engine that uses Aerozene 50 fuel and  $N_2O_4$  oxidizer and is gimballed-mounted to provide pitch and yaw control through second stage burn. A nitrogen gas system using eight fixed nozzles provides roll control during powered and coast flight as well as pitch and yaw control during coast and after second-stage cutoff (SECO). Two fixed nozzles, fed by the propellant-tank helium-pressurization system, provide retrothrust after third stage separation.

### Third Stage

The third stage is the Thiokol TE-364-4 spin-stabilized solid-propellant motor. The third stage motor is secured in a spin table mounted on the second stage. The firing of eight small propellant rockets fixed to the spin table accomplishes spinup of the third stage assembly.

### Injection Into Synchronous Orbit

The Delta vehicle places the spacecraft in an elliptical transfer orbit. The spacecraft apogee motor will be fired at the fifth apogee of the orbit about 48 hours after launch. This maneuver will circularize the orbit at synchronous altitude above the equator. The spacecraft hydrazine attitude control system is used to drift the satellite to its final station at 15.5 degrees W. Longitude. About a month after launch, following checkout of the onboard communications systems, the spacecraft will become operational.

STRAIGHT EIGHT DELTA FACTS AND FIGURES

Height: 35.4 m (116 ft.) including shroud  
Maximum diameter: 2.4 m (8 ft.) without attached solids  
Liftoff weight: 131,895 kg (293,100 lb.)  
Liftoff thrust: 1,765,315 newtons (396,700 lb.) including strap-on solids

First Stage

(Liquid only) consists of an extended long-tank Thor, produced by McDonnell Douglas. The RS-27 engines are produced by the Rocketdyne Division of Rockwell International. The stage has the following characteristics:

Diameter: 2.4 m (8 ft.)  
Height: 21.3 m (70 ft.)  
Propellants: RJ-1 kerosene as the fuel and liquid oxygen (LOX) as the oxidizer  
Thrust: 912,000 N (205,000 lb.)  
Burning time: About 3.48 minutes  
Weight: About 84,600 kg (186,000 lb.) excluding strap-on solids

Strap-on solids consist of nine solid propellant rockets produced by the Thiokol Chemical Corp., with the following features:

Diameter: 0.8 m (31 in.)  
Height: 7 m (23.6 ft.)  
Total weight: 40,300 kg (88,650 lb.) for nine  
4,475 kg (9,850 lb.) for each  
Thrust: 2,083,000 N (468,000 lb.) for nine  
231,400 N (52,000 lb.) each  
Burning time: 38 seconds

## Second Stage

Produced by McDonnell Douglas Astronautics Co., using a TRW TR-201 rocket engine; major contractors for the vehicle inertial guidance system located on the second stage are Hamilton Standard, Teledyne and Delco.

Propellants: Liquid, consists of Aerozene 50 for the fuel and Nitrogen Tetroxide ( $N_2O_4$ ) for the oxidizer.

Diameter: 1.5 m (5 ft.) plus 2.4 m (8 ft.) attached ring

Height: 6.4 m (21 ft.)

Weight: 6,118 kg (13,596 lb.)

Thrust: About 42,943 N (9,650 lb.)

Total burning time: 335 seconds

## Third Stage

Thiokol Chemical Co. TE-364-4 motor.

Propellant: Solid

Height: 1.4 m (4.5 ft.)

Diameter: 1 m (3 ft.)

Weight: 1,152 kg (2,560 lb.)

Thrust: 61,855 N (13,900 lb.)

Burning time: 44 seconds

### LAUNCH OPERATIONS

The Kennedy Space Center's Expendable Vehicles Directorate prepares and launches the thrust-augmented Delta rocket carrying NATO 3-A.

Delta 122 will be launched from Pad B at Complex 17, Cape Canaveral Air Force Station.

The Delta first stage and interstage were erected on Pad B on March 12. The nine solid strap-on rocket motors were mounted in place around the base of the first stage on March 15-16 and the second stage was erected on March 18.

The NATO 3-A spacecraft was received during the second week of March, checked out and mated with the Delta third stage. The third stage/spacecraft assembly is to be mated with Delta on April 14 and the payload fairing which will protect the spacecraft during its flight through the atmosphere is to be erected atop the vehicle on April 20.

# NATO 3-A SEQUENCE OF EVENTS

Event	Time	Altitude		Velocity	
		Kilometers/Miles	Kmph	Mph	
Liftoff	0 sec	0	0	0	
Six solid motor burnout	38 sec	5.9	1,398	869	
Three solid motor ignition	39 sec	6.2	1,392	865	
Three solid motor burnout	1 min 17 sec	21.4	2,949	1,832	
Nine solid motor jettison	1 min 27 sec	25.9	3,239	2,012	
Main engine cutoff (MECO)	3 min 44 sec	92.6	17,928	11,140	
First/second stage separation	3 min 53 sec	98.4	17,953	11,155	
Second stage ignition	3 min 58 sec	102	17,928	11,140	
Fairing jettison	4 min 39 sec	125.4	18,621	11,571	
Second stage first cutoff (SECO-1)	8 min 53 sec	160	26,752	16,623	
Second stage restart	24 min 22 sec	178	26,677	16,576	
Second stage second cutoff (SECO-2)	24 min 32 sec	178	27,166	16,880	
Third stage spin up	25 min 22 sec	181	27,155	16,874	
Second/third stage separation	25 min 24 sec	181	27,155	16,874	

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Event	Time	Altitude		Velocity	
		Kilometers	Miles	Kmph	Mph
Third stage ignition	26 min 6 sec	183	114	27,143	16,866
Third stage burnout	26 min 49 sec	188	117	35,383	21,985
Third stage/spacecraft separation	28 min 2 sec	219	136	35,276	21,920
Transfer orbit apogee	5 hours 42 min	35,796	22,237	6,487	4,031

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DELTA MANAGEMENT

The Expendable Launch Vehicles Program Office in the Office of Space Flight at NASA Headquarters is responsible for program management of the Delta Program. The Delta Project Office, Project Directorate at Goddard Space Flight Center is responsible for overall technical direction and management of the Delta Project.

NASA Headquarters

John F. Yardley	Associate Administrator for Space Flight
Joseph B. Mahon	Director, Expendable Launch Vehicles
I. T. Gillam IV	Manager, Small Launch Vehicles Program
Peter Eaton	Manager, Delta Program

Goddard Space Flight Center

Dr. John F. Clark	Director
Dr. Robert S. Cooper	Deputy Director
Robert N. Lindley	Director of Projects
Robert Baumann	Associate Director of Projects for Delta
Charles R. Gunn	Deputy Project Manager for Delta/Technical
Robert Goss	Chief, Mission Integration and Analysis - NATO-3 Project Manager for NASA
George D. Baker	Chief, Mission Integration
E. Michael Chewning	Mission Integration Engineer
Tecwyn Roberts	Director of Networks

GSFC (cont'd.)

Albert Ferris	Director of Mission and Data Operations
Thomas K. Spencer	Network Support Manager
Raymond Mazur	Mission Support Manager
Seaton B. Norman	Communications Engineer

Kennedy Space Center

Lee R. Scherer	Director
George F. Page	Director, Expendable Vehicles
Hugh A. Weston, Jr.	Manager, Delta Launch Operations
Wayne McCall	Chief Engineer, Delta Operations
John J. Dunn	Spacecraft Coordinator

NATO/DELTA TEAM

NATO/USAF

Col. Robert L. Hayford	Program Manager, USAF/SAMSO
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CONTRACTORS

Aeronutronic-Ford Corp. Palo Alto, Calif.	Spacecraft
McDonnell Douglas Astronautics Co. Huntington Beach, Calif.	Delta Launch Vehicle



March 17, 1976